UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/923,242	08/03/2001	Arne Husth	042933/304258	9112

826 7590 02/27/2007
ALSTON & BIRD LLP
BANK OF AMERICA PLAZA
101 SOUTH TRYON STREET, SUITE 4000
CHARLOTTE, NC 28280-4000

EXAMINER	
WANG, TED M	
ART UNIT	**PAPER NUMBER**
2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/27/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)
	09/923,242	HUSTH, ARNE
	Examiner	Art Unit
	Ted M. Wang	2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-12,14 and 15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-12,14 and 15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, filed on 12/13/2006, with respect to the rejection(s) of claim(s) 1-5, 7-12, 14 and 15 under 35 USC 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of US 6,275,087.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 7-12, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lindquist et al. (US 5,579,347) in view of Dehghn (US 6,275,087).

- With regard claim 1, Lindquist et al. discloses a digitally compensated direct conversion receiver (Fig.1b) having an effective characteristic (Fig.2a and column 5 lines 16-22) comprising:

  determining the modulation extremes of a received modulated signal (column 8 lines 1-12 and column 8 line 38 – column 9 line 20, where $y_I(t)$ is the value of a sample taken at time t (Fig.2 Total Received Signal) that is determined by the receiver and being used to calculate the amplitude "r" of the input signal and the second-order interfering product including DC. Since $y_I(t)$

is continuous function, it is inherent that $y_I(t)$ includes the modulated extremes points (i.e. maximum extreme and minimum extreme).);

determining a DC offset for the signal from the modulation extremes (column 8 line 64 – column 9 line 9, where p_2 is the second order product (or DC offset as described in equation 3 with V_m constant) that based on the modulated extreme.); and processing the signal to compensate for the offset (Fig.6 element 608 and column 9 lines 21-31).

Lindquist et al. discloses all of the subject matter as described in the above paragraph except for specifically teaching applying an inverse filter characteristic to a received modulated signal to compensate for the effect of the effective filter characteristic.

However, Dehghn teaches applying an inverse filter characteristic to a received modulated signal to compensate for the effect of the effective filter characteristic (column 1 lines 37-39) in order to compensate the DC error (column 1 lines 38-39) so that the recovered signal quality is improved.

Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the inverse filter as taught by Dehghn into Lindquist's DSP processing between step START and step 502 so as to compensate the DC error and improve the recovered signal quality.

- With regard claim 2, Lindquist et al. further discloses determining the DC offset (Fig.2a and 2b, column 5 lines16-26, column 8 line 64 – column 9 line 9) with second order product of the input signal based on the signal amplitude by

using a smoothing filter for a sliding average of four symbol periods (column 5 lines 36-61).

Lindquist et al. discloses the claimed invention except for determining the DC offset as substantially the mean of the signal amplitude at the modulation extremes. However, as shown in Figs.2a and 2b, the ideal signal is the signal without the second-order product, and the total received signal is the sum of the ideal signal and the second product (column 5 lines 22-25). It is therefore clear determining the second order product (column 2, lines 26-52) is equivalent to averaging the signal amplitude at the modulation extreme as recited.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Lindquists' DC offset determination method with that of instant application's since determining the DC offset with second order product of the input signal based on the signal amplitude and determining the DC offset as substantially the mean of the signal amplitude at the modulation extreme are equivalent for their use in the single conversion receiver art, and the selection of any of these known equivalents to determine the DC offset of the input modulated signal would be within the level of ordinary skill in the art.

- With regard claim 3, Lindquist et al. further discloses the step of processing the signal comprises subtracting the offset from the signal (column 6 lines 21-27).

- With regard claim 7, all limitation is contained in claim 1. The explanation of all the limitation is already addressed in the above paragraph.
- With regard claims 8 and 9, Lindquist et al. further discloses the signal comprises an in-phase and a quadrature (Q) component of a modulated signal (Fig.1b elements 40 and 50 OUTPUT, I and Q, and column 4 lines 41-50).
- With regard claim 10, Lindquist et al. further discloses the signal is GMSK modulated (column 5 lines 1-15).
- With regard claim 11, Lindquist et al. further discloses a computer program which, when run on a processor, carries out the step of claim 1 (Fig.1b element 130, column 4 lines 41-59, equations 4-8, and column 9 lines 6-21).
- With regard claim 12, which is a receiver mean plus function claim related to claim 1, all limitation is contained in claim 1. The explanation of all the limitation is already addressed in the above paragraph.
- With regard claim 14, Lindquist et al. further discloses a program to be executed by a digital signal processor (Fig.1b element 30, column 4 lines 41-59, equations 4-8, column 6 lines 21-55, and column 9 lines 6-21) in a direct conversion receiver (Fig.1b and column 4 lines 41-45), the receiver comprising a mixer circuit (Fig.1b elements 40 and 50) for providing quadrature related signals from a received modulated signal (Fig.1b elements I and Q and column 4 lines 41-49), a DC cancellation circuit for canceling the DC component in the quadrature related signals and a digital signal processor for removing a residual DC component from the signals (Fig.1b element 30 and

column 6 lines 21-55). All other limitation is contained in claim 11. The explanation of all the limitation is already addressed in the above paragraph.

- With regard claim 15, which is a receiver claim related to claim 1, all limitation is contained in claim 1. The explanation of all the limitation is already addressed in the above paragraph.

4. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lindquist et al. (US 5,579,347) and Dehghn (US 6,275,087) as applied to claim 1 above, and further in view of the admitted prior art of the instant application.

- With regard claim 4, Lindquist et al. and Dehghn disclose all of the subject matter as described above except for specifically teaching the step of processing the signal comprises subtracting a weighted exponential function from the signal.

  However, the admitted prior art of the instant application teaches that the step of processing the signal comprises subtracting a weighted exponential function from the signal (page 1 lines 23-31). Where the admitted prior art of the instant application teaches a DC cancellation circuit (DCN) <u>designed as high pass filters</u> (page 1 line 29), in which <u>capacitors can be rapidly charged/discharged during the DCN period</u> by electronic switching circuits, to obtain <u>a subtraction of the DC offset</u> in each I or Q channel (page 1 lines 29-31). It is well known in the art that the high pass filter characteristics leads to the DC component being a declining exponential function, so that DCN is performed by subtracting a weighted declining exponential function from I/Q samples.

In general, for a high pass filter, each half-cycle the *R-C* circuit behaves like a simple direct current (d.c.) *R-C* circuit, because the input voltage is equal to a constant voltage, given by V_{in}. The voltage (V_{out}) for a charging capacitor across the capacitor can be obtained by the following equations:

$$q(t) = CVin\left(1 - e^{-t/RC}\right)$$

$$Vout = \frac{q}{C}$$

$$Vout = Vin\left(1 - e^{-t/RC}\right)$$

As shown in the above equation, it indicates that the high pass characteristics to the DC component being a declining exponential function, so that compensation is performed by subtracting a weighted declining exponential function from the I/Q samples.

It is desirable to have the DC cancellation circuit (DCN) discloses by the admitted prior art of the instant application in order to reasonably estimated and eliminated the DC offset in later process so that the received signal can be substantially free from distortion. Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the method as taught by the admitted prior art of the instant application, in which, implementing subtracting a weighted exponential function from the signal, into Lindquist and Dehghns' DC cancellation process in order to reasonably estimated and eliminated the DC offset in later process so that the received signal can be substantially free from distortion.

- With regard claim 5, Lindquist et al. and Dehghn disclose all of the subject matter as described above except for specifically teaching wherein the weighting of the exponential function comprises the determined DC offset.

However, the admitted prior art of the instant application teach a DC cancellation circuit (DCN) designed as high pass filter characteristics to the DC component in which <u>capacitors can be rapidly charged/discharged during the DCN period</u> by electronic switching circuits, to obtain <u>a subtraction of the DC offset</u> in each I or Q channel (page 1 lines 29-31).

It is desirable to have the weighting of the exponential function comprises the determined DC offset in order to reasonably estimated and eliminated the DC offset in later process so that the received signal can be substantially free from distortion. Therefore, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include the method as taught by the admitted prior art of the instant application, in which, have the weighting of the exponential function comprises the determined DC offset, into Lindquist and Dehghns' DC cancellation process in order to reasonably estimated and eliminated the DC offset in later process so that the received signal can be substantially free from distortion.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ted M. Wang whose telephone number is 571-272-3053. The examiner can normally be reached on M-F, 7:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ted M. Wang

Ted M Wang
Examiner
Art Unit 2611